

U.S.S.N. 10/057,026

a metal seed layer on said first photoresist layer and an inkjet orifice formed in said metal seed layer; and

a Ni layer on top of said metal seed layer with an aperture formed therein in fluid communication with said inkjet orifice.

REMARKS

Thorough examination and careful review of the application by the Examiner is noted and appreciated.

Claims 11-20 are pending in the application. Claims 11-20 stand rejected.

Objection To The Claims

Claim 11 is objected to for containing informalities.

Claim 11 has been amended to correct the informalities by eliminating the reference to the second insulating material layer.

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Claim Rejections Under 35 USC §112

Claims 11-20 are rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claim 11 has been amended by removing the reference made to a second insulating material layer formed on the bottom surface.

The rejection of claim 11 is respectfully traversed. A reconsideration for allowance of claims 11-20 is respectfully requested of the Examiner.

Claim Rejections Under 35 USC §103

Claims 11-12, 14-17 and 20 are rejected under 35 USC §103(a) as being unpatentable over Leban '171 in view of Mitani et al '648, Taub et al '442 and Hawkins et al '245. It is contended that Leban teaches the claimed invention except of a first insulating layer made of silicon dioxide at a thickness of at least 1000 Å, a funnel-shaped manifold in the substrate, a metal seed layer on the first photoresist layer, a nickel layer on top of the metal seed layer, the heater in the primary ink chamber being ring-

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shaped and the seed layer being either Ni or Cr. It is further contended that Mitani et al teaches the silicon dioxide insulating layer between 10000 and 20000 Å thickness; Taub et al teaches funnel-shaped ink fill slots and Hawkins et al teaches an orifice plate wherein an Ni or Cr seed layer is formed over a substrate and then a plate layer of nickel is deposited over the seed layer.

The rejection of claims 11-12, 14-17 and 20 under 35 USC §103(a) based on Leban, Mitani et al, Taub et al and Hawkins et al is respectfully traversed.

The present invention, as clearly recited in independent claim 11, recites:

"Claim 11. A thermal bubble inkjet head having off-shooter heaters and a rapid ink refill mechanism comprising:

- a silicon substrate ...;
- a first insulating material layer of at least 1000 Å thick on said top surface;
- a funnel-shaped manifold formed in said ...;
- two spaced-apart heaters formed on said first insulating material layer ...;

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...;

...;

a first photoresist layer of at least 2000Å thick on top of said third insulating material layer;

a primary and an auxiliary ink chamber formed in said first photoresist layer in fluid communication with each other and with said funnel-shaped manifold ...;

..."

In the Response to Arguments section of the 1/15/2003 Office Action, the Examiner argued that "Applicant's argument that the funnel-shaped ink fill slots of Taub et al are not in fluid communication with an ink chamber is not persuasive". The Applicants respectfully traverse the Examiner's contention in that the present invention does not merely teach a funnel-shaped manifold in fluid communication with an ink chamber, but instead, teaches and claims:

"A primary and an auxiliary ink chamber ... in fluid communication with each other and with said funnel-shaped manifold".

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The Applicants respectfully submit that, as agreed by the Examiner that while Leban et al does not teach a manifold at all, and that Taub et al teaches a manifold in fluid communication with a single ink chamber, none of the two references, either singularly or in combination thereof, teaches a funnel-shaped manifold that is in fluid communication with both a primary and an auxiliary ink chamber.

The Applicants further submit that such characteristic of the present invention is further not taught by Mitani et al and Hawkins et al.

The rejection of claims 11-12, 14-17 and 20 under 35 USC §103(a) based on Leban, Mitani et al, Taub et al and Hawkins et al is respectfully traversed. A reconsideration for allowance of these claims is respectfully requested of the Examiner.

Claims 13 and 18 are rejected under 35 USC §103(a) as being unpatentable over Leban, Mitani et al, Taub et al, Hawkins et al and further in view of Moon et al '027. It is further contended that Moon et al teaches a ring-shaped heater that is not taught by the other references.

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The Applicants respectfully traverse the rejection of claims 13 and 18 under 35 USC §103(a) based on the four references and Moon et al.

As previously presented, the Applicants have shown that the basic structure of independent claim 11 is not taught or disclosed by the four references, either singularly or in combination thereof. Specifically, the formation of a primary and an auxiliary ink chamber in a photoresist layer that is in fluid communication with a funnel-shaped manifold. The Applicants therefore respectfully submit that the additional reference of Moon et al does not lend any additional weight in a §103(a) rejection.

The rejection of claims 13 and 18 under 35 USC §103(a) based on Leban, Mitani et al, Taub et al, Hawkins et al and Moon et al is respectfully traversed. A reconsideration for allowance of these claims is respectfully requested of the Examiner.

Based on the foregoing, the Applicants respectfully submit that all of the pending claims, i.e. claims 11-20, are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

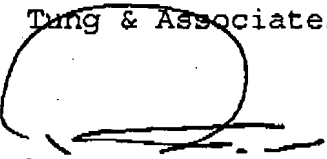
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Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version With Markings To Show Changes Made".

In the event that the present invention is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims

Claim 11 has been amended as follows:

11. (Amended) A thermal bubble inkjet head having off-shooter heaters and a rapid ink refill mechanism comprising:

a silicon substrate having a top surface and a bottom surface;

a first [and a second] insulating material layer of at least 1000 Å thick on said top [and bottom surfaces] surface;

a funnel-shaped manifold formed in said [second insulating material layer and said] silicon substrate;

two spaced-apart heaters formed on said first insulating material layer on said top surface;

two interconnects formed of a conductive metal each in electrical communication with one of said two spaced-apart heaters;

a third insulating material layer on top of said two spaced-apart heaters and said first insulating material layer;

a first photoresist layer of at least 2000Å thick on top of said third insulating material layer;

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a primary and an auxiliary ink chamber formed in said first photoresist layer in fluid communication with each other and with said funnel-shaped manifold;

a metal seed layer on said first photoresist layer and an inkjet orifice formed in said metal seed layer; and

a Ni layer on top of said metal seed layer with an aperture formed therein in fluid communication with said inkjet orifice.

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